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NUCLEAR SCIENCE ABSTRACTS

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GENERAL

RESEARCH PROGRAMS

3092 UR-423
Rochester, N. Y. Univ. Atomic Energy Project.
INDEX OF REPORTS AND PUBLICATIONS BY THE UNIVERSITY OF ROCHESTER ATOMIC ENERGY PROJECT. Henry A. Blair. July 31, 1955. 213p. Contract W-7401-eng-49. $33.30(ph OTS); $9.60(mf OTS).

This index covers the declassified and unclassified work of the University of Rochester Atomic Energy Project from its beginning in 1943 until July 1955. It contains titles of the work described in Manhattan District and Atomic Energy Commission reports as well as of material published in books and journals. The titles are grouped under broad subject headings, and an author index is included. (C.H.)

BIOLOGY AND MEDICINE

3093 BNL-350
Brookhaven National Lab., Upton, N. Y.
MUTATION. REPORT OF SYMPOSIUM HELD JUNE 15 TO 17, 1955. Brookhaven Symposia in Biology No. 8. 240p. $1.25(OTS).

Scientists working on diverse species and studying mutation from different perspectives were brought together to report recent findings and their bearing on earlier work. These papers and the discussions which ensued are presented. Author and subject indexes are included. (C.H.)

3094 AEC-tr-2385
RESEARCHES ON THE MECHANISM OF THE ACTIONS OF THE HYDRAZIDES OF ISONICOTINIC ACID: THEIR RELATIONSHIP TO HEMIN AND ANALOGOUS SUBSTANCES. S. Garattini and P. Y. Moriguchi. Translated by Soliska R. Harris from Giorn. ital. chemioterapia 1, 579-84(1954). 9p.

On the basis of experiments on the antagonism between isonicotinic hydrazide (INI) and hemin, it is shown that hemoglobin, hematoporphyrin, and pyrrole are capable of antagonizing, though not so strongly as hemin, the inhibiting effect of INI on mycobacteria. Chlorophyll is thoroughly inefficient. Some metals, as Fe, Cu, Mn (very strongly) and Zn (just slightly) can increase the anti-INI effectiveness of the above mentioned substances, and particularly of hemin. Sodium pyruvate, which is capable of inhibiting INI effects, does not potentiate the antagonistic action of hemin. Pyridoxal proves capable of a direct inhibiting effect on INI and, furthermore, it potentiates the action exerted by hemin. (auth)

RADIATION EFFECTS

3095 BNL-2562
Brookhaven National Lab., Upton, N. Y.
STUDIES ON THE ELIMINATION OF DIFFERENT CLASSES OF RADIATION-INDUCED MUTATIONS FROM THE OVARIES OF DROSOPHILA MELANOGASTER. R. C. King, Jean B. Darrow, and Nancy E. Weber. [1955?]. 16p. $3.20(ph OTS); $2.40(mf OTS).

RADIATION HAZARDS AND PROTECTION

3096 UR-422
Rochester, N. Y. Univ. Atomic Energy Project.
STUDIES ON FLASH BURNS: THE SCREENING EFFECT OF FABRIC AT A DISTANCE FROM ANIMALS. H. W. Bales, R. E. Roth, and H. E. Pearse. Dec. 20, 1955. 12p. Contract W-7401-eng-49. $3.30(ph OTS); $2.40(mf OTS).

A method of testing fabrics for their screening value against flash burns by interposing a fabric between a pig and ignited magnesium flash powder is presented. All fabrics offered some protection from flash burns. Of the fabrics tested, 8.5 oz gray sateen affords the best protection and cotton tubing the least. The darker OG 8.5 oz sateens were intermediate. A nylon-vinyl poncho material was a hazardous screen because of contact burns produced by its flaming. (auth)

TOXICOLOGY STUDIES

3097 UR-417
Rochester, N. Y. Univ. Atomic Energy Project.
BERYLLIUM SENSITIZATION IN PIGS. R. D. Armstrong, L. J. Leach, W. L. Downs, E. A. Maynard, H. C. Hodge, and R. C. Kesel. Dec. 5, 1955. 7p. Contract W-7401-eng-49. $1.80(ph OTS); $1.80(mf OTS).

Swine receiving beryllium oxide by inhalation, intraperitoneal injection, or transbronchial insufflation developed a sensitivity to Be as determined by a skin test administered three to five months after treatment. (auth)

TRACER APPLICATIONS

3098 UCRL-3242
California. Univ., Berkeley. Radiation Lab.
PHOSPHATE TRANSIENTS IN PHOTOSYNTHESIS. Dan F. Bradley. Dec. 21, 1955. 28p. Contract W-7405-eng-48. $0.25(OTS).

Transient changes in the P^{32} activity of PPA, PGA, OP, GP, ATP, ADP, and RDP when the illumination is terminated and initiated have been measured in Scenedesmus. The signs of the transients, their order of appearance, and the number of maxima and minima are consistent with a model involving production of ATP from OP and ADP by the oxidation of photochemically produced $TPNH_2$, the reduction of PGA with the photoproduced ATP and $TPNH_2$, the formation of GP from the resulting triose phosphate, the phosphorylation of RMP formed from the GP mediated by photoproduced ATP, and the production of PPA from PGA. The effect of CO_2 upon the stationary state and transients of PGA and RDP is consistent with the carboxylation of RDP to form PGA. (auth)

3099 UR-421
Rochester, N. Y. Univ. Atomic Energy Project.
INFLUENCE OF INJECTION SOLUTION TREATMENT ON BLOOD DISAPPEARANCE RATES AND TISSUE DISTRIBUTION OF POLONIUM^{210}. Robert G. Thomas and J. N. Stannard. Dec. 14, 1955. 19p. Contract W-7401-eng-49. $3.30(ph OTS); $2.40(mf OTS).

Factors influencing the kinetics of blood disappearance and tissue distribution of Po^{210} following injection into rats are discussed. Necessity for the careful control of injection solutions is emphasized. (C.H.)

3100 UR-428
Rochester, N. Y. Univ. Atomic Energy Project.
THE UPTAKE OF RADIOCOLLOIDS BY MACROPHAGES IN VITRO. A KINETIC ANALYSIS WITH RADIOACTIVE COLLOIDAL GOLD. Robert E. Gosselin. Jan. 31, 1956. 40p. Contract W-7401-eng-49. $6.30(ph OTS); $3.00 (mf OTS).

Inflammatory macrophages were obtained from the peritoneal cavity of rabbits. Isolated cells were incubated in vitro under carefully controlled conditions in suspensions of radioactive colloidal gold. After incubation, the uptake of colloidal particles was analyzed kinetically. Based on the data, a hypothesis concerning the mechanism of ultraphagocytosis is presented. (C.H.)

WASTE DISPOSAL

3101 AECU-3113
Texas. Univ., Austin. Sanitary Engineering Labs.
OXIDATION PONDS—WASTE TREATMENT STUDIES, RADIOISOTOPE UPTAKE, AND ALGAE CONCENTRATION. Technical Report No. 2. E. F. Gloyna, E. R. Hermann, and W. R. Drynan. June 1, 1955. 98p. Contract AT-(11-1)-220.

As a step toward developing design and operating criteria for oxidation ponds, two pilot plants were constructed and placed in operation. Design data are presented. Numerous wastes and conditions were studied and typical experimental results are reported. Based on the experimental results, it is not recommended that oxidation ponds be used as primary radioisotope control and removal devices. However, oxidation ponds can be designed to be one of the most effective ways to concentrate, delay, and possibly remove many of the radioisotopes that may be in waste streams, especially when these isotopes are in concentrations approaching approved tolerance levels. Dilution, radioactive decay, biological and chemical concentration with detention and subsequent dilution, and combinations of these and several other mechanisms are ways in which oxidation ponds may delay the radioactive isotope from reaching a stream. (C.H.)

CHEMISTRY

3102 ISC-586
Ames Lab., Ames, Iowa
RATIO OF SOLID VELOCITY TO MIXTURE VELOCITY IN SLURRY FLOW. Richard J. Burian and Glenn Murphy. Mar. 1955. 84p. Contract W-7405-eng-82. $0.50(OTS).

The study consisted of two parts, a theoretical analysis of the problem and an experimental investigation under controlled conditions. The theoretical analysis resulted in an equation which expressed the velocity ratio in terms of dimensionless parameters representing the distribution of the particles in the mixture, the slip between the solid particles and the adjacent fluid, and the velocity distribution of the fluid in the conduit. In the experimental part of the study a dimensional analysis was performed on the variables which seemed most likely to influence the problem. The dimensionless parameters were then combined into a single equation by use of the principles of similitude. In this way the equation obtained is entirely general within the range tested. The tests were performed on slurries composed of several types of glass, steel and lead spheres in water flowing through a glass tube. The conclusions drawn include: the velocity ratio (1) increases as the size of the particles and the velocity increases, (2) decreases as the density of the particles increases, and (3) is independent of temperature and concentration. The equation obtained from the theoretical analysis was written in the form of the experimental equation and the corresponding terms compared. Since the theoretical analysis involved several simplifying assumptions, it was thought that one or several of these caused some discrepancy in the results. The various assumptions were discussed and the ones most likely in error pointed out. (auth)

3103 KAPL-1377
Knolls Atomic Power Lab., Schenectady, N. Y.
THERMAL STABILITY OF FERROUS HYDROXIDE PRECIPITATES. F. J. Shipko and D. L. Douglas. Nov. 1, 1955. 43p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

The stability of $Fe(OH)_2$ precipitates at temperatures up to 316°C has been investigated. Pure $Fe(OH)_2$ in contact with solutions of KCl containing either excess Fe^{2+} or excess OH^- and with rigorous exclusion of O_2 were found to be completely stable for periods up to six months at temperatures below 100°C. When precipitated with nickel hydroxide the spontaneous reaction $3\ Fe(OH)_2 \rightleftharpoons Fe_3O_4 + H_2 + 2H_2O$ takes place at ordinary temperatures with an activation energy of 10,200 ± 1000 cal/mol. At temperature in the range 150 to 210°C pure $Fe(OH)_2$ decomposes according to the above reaction with a conveniently measurable rate. The activation energy was measured and found to be 30,000 ± 3,000 cal/mol. By x-ray structure analysis and microscopic examination, α-iron was identified in the $Fe(OH)_2$ at 178°C, and above. (auth)

3104 UCRL-3240
California. Univ., Berkeley. Radiation Lab.
CHEMISTRY DIVISION QUARTERLY REPORT [FOR] SEPTEMBER, OCTOBER, NOVEMBER 1955. Dec. 20, 1955. 85p. Contract W-7405-eng-48. $0.50.

Bio-Organic Chemistry. Progress is reported in studies on the following subjects: the mechanism of photochemical reactions during photosynthesis; the identification and chemical nature of intermediate photosynthetic products; the preparation of C^{14}-labeled calcium glycolate; the partition chromatography of gaseous CO_2 with N as the eluting gas; the resolution of synthetic DL-valine; the synthesis of glycine-2-C^{14}; the synthesis of carnitine hydrochloride; the liquid scintillation counting of tritium by means of coincidence techniques; tracer studies on the metabolism of acetate, glucose, fructose, and glycine in mice with a hereditary obesity-diabetes syndrome; and tracer studies on the incorporation of adenine into nucleotides and nucleic acids in mice. Nuclear Chemistry. Optical properties of $LaCl_3$ crystals containing $EuCl_2$ are outlined. A 3 mμ sec metastable state of Pb^{209} was found. A double hexagonal close-packed structure is described for Am. The reaction products of Ta with 5.7-Bev protons are tabulated. Additional spectral data are reported for Po^{206}, Th^{227}, and Ra^{223}. Fission and spallation cross sections for Am^{241} and U^{235} are presented. The interaction of high-energy protons with nuclei, absorption spectra of Ru^{3+} in $HClO_4$, and the radiolysis of trichloroethylene are discussed. (For preceding period see UCRL-3157.) (C.H.)

ANALYTICAL PROCEDURES

3105 HW-39971
Hanford Atomic Products Operation, Richland, Wash.
AMERICIUM-241 AS A PHOTON SOURCE FOR THE GAMMA ABSORPTIOMETRIC TECHNIQUE. D. G. Miller. Nov. 17, 1955. 17p. Contract W-31-109-Eng-52. $3.30 (ph OTS); $2.40(mf OTS).

The use of Am^{241} as a photon source in the gamma absorptiometric technique for the determination of U or Pu in aqueous solutions at concentrations < 100 g/l is discussed. The major disadvantage of Am^{241} is its low photon intensity. Other possible photon sources are tabulated. (See also HW-36788.) (C.W.H.)

3106 HW-40285
Hanford Atomic Products Operation, Richland, Wash.
POLAROGRAPHY: EFFICIENT REMOVAL OF DISSOLVED OXYGEN. K. Koyama and C. E. Michelson. Nov. 17, 1955. 9p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80 (mf OTS).

Fritted gas-bubbling tubes have reduced the deaeration period for the removal of dissolved O_2 from aqueous solutions to less than 2 min. (C.W.H.)

3107 HW-40497
Hanford Atomic Products Operation, Richland, Wash.
DETERMINATION OF ALUMINUM IN CHROMIC-PHOSPHORIC ACID SOLUTIONS. DETERMINATION OF ALUMINUM IN ALUMINUM CORROSION PRODUCTS. C. Groot, R. M. Peekema, and V. H. Troutner. Jan. 16, 1956. 29p. Contract W-31-109-eng-52. $4.80(ph OTS); $2.70(mf OTS).

A method is described for the determination of Al in Al corrosion products. The corrosion products are stripped from the Al with 2% chromic - 5% phosphoric acid solution. This solution is analyzed colorimetrically for Al using aurintricarboxylate (aluminon). Methods for minimizing interference caused by chromate ion and phosphoric acid include precipitating the Al as phosphate, thus removing the chromate ion and limiting the amount of phosphate and separating the chromate ion from the Al with anion exchange resin. The second method is more rapid and convenient. Interference caused by phosphoric acid is not serious if the 2% chromic—5% phosphoric acid solutions contain at least 170 ppm Al. This Al determination is accurate to ±3%. (auth)

3108 ISC-663
Ames Lab., Ames, Iowa.
SURVEY OF MASKING AGENTS USED IN QUANTITATIVE ANALYTICAL CHEMISTRY. Jan. 3, 1956. 25p. Contract W-7405-eng-82. $4.80(ph OTS); $2.70(mf OTS).

Results of a survey of the analytical literature from 1950 to 1955 are presented. Reagents for masking interfering materials in analytical titrations, precipitations, colorimetric determinations, extractions, and some instrumental techniques are listed with their applications. (auth)

3109 ORNL-1396
Oak Ridge National Lab., Tenn.
DETERMINATION OF SUBMICROGRAM QUANTITIES OF CHROMIUM AND VANADIUM IN ALKALI HYDROXIDES. D. L. Manning, W. K. Miller, and R. Rowan, Jr. Sept. 8, 1952. Decl. Nov. 22, 1955. 26p. Contract W-7405-eng-26.

An ion exchange method has been developed for the separation of trace quantities of Cr and V from large samples of alkali hydroxides. These elements can then be concentrated into a small volume. Chromium is determined colorimetrically in the resulting solution by the diphenylcarbazide method, while V is determined by an indirect colorimetric method based on the ferrous-o-phenanthroline complex. (auth)

LABORATORIES AND EQUIPMENT

3110 ANL-5499
Argonne National Lab., Lemont, Ill.
THE PROCESS EQUIPMENT AND PROTECTIVE ENCLOSURES DESIGNED FOR THE FUEL FABRICATION FACILITY NO. 350. A. B. Shuck and R. M. Mayfield. Jan. 1956. 217p. Contract W-31-109-eng-38. $1.00 (OTS).

Concepts, design, mock-up construction, and testing of equipment and hoods for the fabrication of reactor fuels containing plutonium or U^{233} are described. The building to house the hood and equipment systems is described briefly. Particular emphasis is placed upon the process equipment requirements, radiological and toxicological hazards, hooding concepts, hood designs and construction. The hoods of this design consist of aluminum alloy frames fabricated from extrusions which are so designed that $^3/_8$-inch thick transparent allyl plastic or aluminum plates may be installed in preformed grooves by means of restrained, tight-sealing, neoprene gaskets. Manipulation within the hoods is by means of arm-length neoprene gloves sealed to glove rings on the transparent panels. Flanges and gasket grooves allow bolting together of any number of hood modules, with or without partitions, into assemblies to form interconnecting hood lines. A modular design was worked out to allow the use of many standardized parts and to provide flexible conformity to wide variety of equipment and operations through the modification of standardized hood sections. The three hood systems housing equipment for work on bare fuel alloys, for the transition operations of jacketing, and for work on clad materials are described hood line by hood line. (auth)

SEPARATION PROCEDURES

3111 ACCO-19
American Cyanamid Co. Atomic Energy Div., Watertown, Mass.
EXPERIMENTAL WORK FOR THE DEVELOPMENT OF A PROCESS TO TREAT LUKACHUKAI ORES. Galen W. Clevenger. June 9, 1952. Decl. Sept. 23, 1955. 47p. Contract AT(49-1)-533.

Data are given for leaching ores from the Lukachukai District, Arizona with sulfuric acid or sodium carbonate. Methods are presented for a sulfuric acid extraction of both uranium and vanadium with the recovery of high grade uranium and vanadium products. A flowsheet for recovery of uranium by sulfuric acid leaching and anion exchange of the leach solutions is recommended. (auth)

3112 DOW-81

Dow Chemical Co. Western Div., Pittsburgh, Calif. THE RECOVERY OF URANIUM FROM INDUSTRIAL PHOSPHORIC ACIDS BY SOLVENT EXTRACTION. PART I. SUMMARY STATUS REPORT. PART II. INDEX OF MONTHLY PROGRESS REPORTS. D. A. Ellis. July 14, 1952. Decl. Sept. 29, 1955. 79p. Contract AT-30-1-GEN-236.

A process for the recovery of U from industrial phosphoric acids by liquid-liquid extraction with alkyl ortho- and pyro-phosphoric acids is described. Studies of the chemistry and mechanics of the extraction process and various methods for recovery of U from the organic extract are reported. An index of monthly progress reports covering the period from March, 1951 through June, 1952 is included. (J.E.D.)

3113 RMO-2041

International Minerals and Chemical Corp., Chicago. URANIUM RECOVERY—LEACHED ZONE PROCESSES. Henry M. Heidt, Donald E. Tynan, J. B. Adams, and Roger Bart. Feb. 28, 1955. Decl. Oct. 27, 1955. 65p. Contract AT(49-1)-545. (IMCC-2212).

The laboratory research and pilot plant development programs on the U extraction processes from various types of U-bearing leached zone extracts are summarized. (J.E.D.)

3114 RMO-2510

Rohm and Haas Co. Research Labs., Philadelphia. INVESTIGATION OF THE ION EXCHANGE RESINS IN USE IN SOUTH AFRICA. Sallie A. Fisher. Aug. 28, 1952. Decl. Sept. 23, 1955. 19p. Contract AT(49-1)-535.

An investigation of the "poisoned" Compound A and Amberlite IRA-400 in use at Western Reefs, South Africa indicates that silica is the principal cause of the sudden losses of uranium capacity. Regeneration with sodium sulfide has restored relatively new Compound A and IRA-400 to their original capacities but old IRA-400 has only 75% of its original capacity after this treatment. Periodic alkaline regeneration to remove accumulated silica is recommended. (auth)

3115 RMO-2512

Rohm and Haas Co. Research Labs., Philadelphia. ELECTROLYTIC RECOVERY OF URANIUM AND VANADIUM FROM CLIMAX LEACH LIQUORS. Paul F. Kirk. Dec. 31, 1952. Decl. Sept. 23, 1955. 19p. Contract AT(49-1)-535.

An electrolytic method has been investigated for the recovery of uranium and vanadium from the pregnant leach liquors of the Climax Uranium Co. This method, employing anion-permeable membranes, has been found capable of effecting virtually complete recovery of both metals and a fair separation of the two. A recovery of the acid value of the leach liquor is also achievable. The leaching of Climax ore in the anode chamber was investigated and shows some promise. (auth)

Refer also to abstracts 3119 and 3122.

TRANSURANIC ELEMENTS AND COMPOUNDS

3116 UCRL-3209

California. Univ., Berkeley. Radiation Lab. ION-EXCHANGE BEHAVIOR OF ACTINIDES AND LANTHANIDES (thesis). Joseph Pleas Surls, Jr. Jan. 1956. 61p. Contract W-7405-eng-48. \$10.80(ph OTS); \$3.90(mf OTS).

The ion-exchange behavior of tripositive Pu, Am, Cm, Bk, Cf, E, Fm, Ce, Pm, Eu, Gd, Tb, Dy, Ho, Tm, Lu, and Y from Dowex-1 anion-exchange resin with NH_4SCN solutions has been studied. Lanthanides and Y elute sooner than actinides under all conditions studied. Neither actinides nor lanthanides showed a simple elution sequence of the numbers within the series. On elution from Dowex-50 with NH_4SCN the actinides eluted in the usual sequence of decreasing atomic number. The lanthanides studied also exhibited the usual sequence of elution from Dowex-50; however, the actinides eluted sooner than the lanthanides of comparable ionic radius. The absorption of lanthanides, Am, and Cm on Dowex-50 from low ionic strength $HClO_4$ solutions was studied at 25°C. The relative adsorbability decreases from La to Dy, but from Dy to Lu, almost no change in adsorbability occurs. Americium and Cm adsorb with the same strength as lanthanides of comparable crystallographic radius Thermodynamic quantities were evaluated for the adsorption of Pm, Tm, Lu, and Am by studying the variation of adsorbability at 0, 25, and 50°C in weak $HClO_4$. Relative activity coefficients of very dilute $CeCl_3$ in HCl are given for ionic strengths of 0.02 to 0.1. Relative activity coefficients of $M(ClO_4)_3$, where M is a very dilute tripositive actinide or lanthanide ion, $HClO_4$ are given for ionic strengths of 0.03 to 0.73. (auth)

URANIUM AND URANIUM COMPOUNDS

3117 ACCO-46

American Cyanamid Co. Atomic Energy Div. Raw Materials Development Lab., Winchester, Mass. RECOVERY OF URANIUM FROM VITRO LEACH LIQUORS BY ION EXCHANGE. PART II. CYCLIC COLUMN TESTS COMPARING IRA-400 AND XE-75 RESINS AND CYCLIC TESTING OF A RESIN-IN PULP SYSTEM. Norman N. Schiff and Hans I. Viklund. May 3, 1954. Decl. Sept. 23, 1955. 56p. Contract AT(49-1)-533.

A three-column ion exchange test program on Vitro leach liquors was run to compare the performance of IRA-400 and SE-75 resins with respect to loading, elution, and poisoning characteristics. When a high Mo liquor was used as feed to the columns, Mo poisoning was shown to occur with both IRA-400 and XE-75 resins; however, this poisoning action was much less rapid and less extensive in the case of XE-75. In this respect the XE-75 was found to be similar to Permutit SE. The use of a 6% caustic regenerant completely restored the ion exchange properties of the poisoned XE-75 resin. A cyclic resin-in-pulp process for recovery of U from Vitro leach liquors and pulps was studied. The Winchester cell was employed in conjunction with XE-123 resin (a plus 20 mesh resin with the exchange characteristics of XE-75). Performance data, including the effects of Mo poisoning, indicate that a 12 cell string may be used effectively with 7 cells on exhaustion and 5 on elution. (auth)

3118 ACCO-48
American Cyanamid Co. Atomic Energy Div. Raw Materials Development Lab., Winchester, Mass.
SUMMARY OF CARBONATE LEACHING OF URANIUM ORES. Andrew J. Frank. June 18, 1954. Decl. Sept. 23, 1955. 34p. Contract AT(49-1)-533.

A review of the chemistry of uranium carbonate systems and the leaching of U ores and compounds is presented. Methods for recovering U from carbonate leach solutions are discussed. 132 references. (C.W.H.)

3119 ACCO-59
American Cyanamid Co. Atomic Energy Div. Raw Materials Development Lab., Winchester, Mass.
SYSTEMATIC ELUTION STUDIES. PART I. THE EFFECT OF SULFATE ACCUMULATION ON THE ELUTION OF URANIUM FROM STRONG BASE ION EXCHANGE RESINS WITH CHLORIDE. A. R. Kazanjian. [July 29, 1954]. Decl. Sept. 23, 1955. 22p. Contract AT(49-1)-533.

The increase in the volume of chloride eluate required for complete elution as the number of cycles of operation progresses has been studied. The build-up in solution of the concentration of sulfate has been found to be responsible for this phenomemon. It was found, also, that addition of ammonium sulfate to provide a concentration of above 100 g SO_4/l resulted in a reduction in the number of volumes of eluting solution required to a value only slightly greater than that required in the absence of sulfate. The effects of the presence of Na and $MgSO_4$ were similarly studied, but these salts led only to increasing the number of column volumes of eluate required. (auth)

3120 AECD-3703
National Lead Co. of Ohio, Cincinnati.
URANIUM RECOVERY FROM COMPOSITE UF_4 REDUCTION BOMB WASTES. E. R. Johnson, R. L. Doyle, J. R. Coleman, A. B. Kreuzmann, E. O. Rutenkroger, and W. H. Malotte. Jan. 28, 1954. Decl. with deletions Aug. 18, 1955. 46p. Contract AT(30-1)-1156.

A number of techniques have been investigated on a laboratory-scale for separating U from fluorides during the recovery of U from UF_4 reduction bomb wastes by an HCl leach—NH_4OH precipitation process. Among these are included adsorption of fluorides from filtered leach liquors, fractional precipitation of fluorides and U, complexing of fluorides into forms soluble in slightly acid solutions, and fluoride volatilization from the U concentrate. Solubility studies of CaF_2 and MgF_2 in aqueous hydrochloric acid at various acidities and temperatures were also conducted. A description of the production-scale processing of C-oxide in the FMPC scrap plant has been included. (auth)

3121 BMI-1067
Battelle Memorial Inst., Columbus, Ohio.
THE SOLUBILITY OF GASES IN WATER AND IN AQUEOUS URANYL SALT SOLUTIONS AT ELEVATED TEMPERATURES AND PRESSURES. Elmer F. Stephan, Nathan S. Hatfield, Robert S. Peoples, and H. A. H. Pray. Jan. 23, 1956. 60p. Contract W-7405-eng-92. $10.80(ph OTS); $3.90(mf OTS).

The solubilities of O_2, H_2, He, Xe, and D_2 in UO_2SO_4 and UO_2F_2 solutions, water, and water-d_2 at elevated temperatures and pressures are reported. The solubility of O_2 in H_2O at elevated temperatures is no longer a linear function of the oxygen partial pressure when that pressure increases above 1500 psia; in UO_2SO_4 solutions, this deviation occurs at even lower partial pressures. (See also BMI-840, BMI-870, and BMI-897.) (C.W.H.)

3122 DOW-131
Dow Chemical Co. Western Div., Pittsburg, Calif.
RECOVERY OF URANIUM FROM COLORADO PLATEAU ORES BY SOLVENT EXTRACTION. David A. Ellis, Robert R. Grinstead, Roberta L. Mason, James E. Magner, Ray S. Long, and K. Glenn Shaw. July 29, 1955. Decl. Sept. 29, 1955. 104p. Contract AT-30-1-GEN-236.

The laboratory development of a process for the recovery of U from sulfuric acid leaches of Colorado Plateau ores by solvent extraction with alkyl phosphate esters is presented. Single-stage equilibrium studies and multistage mixer-settler runs with a number of leach liquors and a series of extractant solutions are discussed. Variables involved in pretreatment of the leach liquors, extraction into the organic phase, stripping from the loaded extractant and recovery from the strip solutions have been investigated. (auth)

3123 K-434
Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.
DETERMINATION OF ALPHA ACTIVITY OF URANIUM IN MUD. C. A. Kienberger, R. E. Greene, and C. E. Pepper. July 15, 1949. Decl. Sept. 8, 1955. 8p. (KLO-132).

A method for the isolation of traces of U in mud, silt and sewage disposal sludges and the determination of its α activity is described. The method employs solvent extraction, using di-ethyl ether and ammonium nitrate, for the recovery of U into a state sufficiently pure for electrodeposition and subsequent α counting. At the 95% probability level, this method gives a precision of eleven % and a low bias of six % at trace concentrations. The precision of A counting of the isolated U is limited by its counting rate, the lower limit being about two alpha counts per minute. (auth)

3124 NYO-3916
Tufts Coll., Medford, Mass.
THE REACTION OF ORGANOSODIUM COMPOUNDS WITH URANIUM TRIBROMIDE. (WITH STUDIES ON THE NATURE AND SEPARATION OF REACTION PRODUCTS). Annual Report for Year Ending June 1, 1954. Thomas R. P. Gibb, Jr., Edward J. Goon, and Edwin B. Damon. June 15, 1954. Decl. Oct. 7, 1955. 49p. Contract AT(30-1)-1355.

The reaction of sodium in biphenyl, amylsodium, sodium benzophenone ketyl, and sodium naphthalene glycol ether with UBr_3 is reported. Evidence is given that colloidal U is formed in certain instances but is too reactive to be isolated except in partially oxidized form. Reduction by organosodium reagents in the presence of H_2 gas does not lead to U hydride in the reactions studied. Various observations on the reactivity of finely divided U and UBr_3 with possible leaching agents are described. Uranium powder reacts with water, dilute base, isopropyl alcohol and, to some extent, with ether-methanol and acetone, but not with liquid ammonia. Uranium tribromide reacts with isopropyl alcohol and sodium isopropoxide forming isopropylates and with liquid ammonia probably to form the insoluble triamide. The density and x-ray-diffraction pattern of U hydride as a function of H_2 content have been measured, and a preliminary report is given indicating partial removal of H at low temperature does not greatly increase the density above that of UH_3. A special drybox and certain anaerobic techniques are described together with a microscope hot-stage for observations in vacuum or under high gas pressures. (auth)

Refer also to abstract 3105.

WASTE DISPOSAL

3125 HW-40460
Hanford Atomic Products Operation, Richland, Wash.
AUTOMATION IN THE BETA MONITORING OF LIQUID WASTE STREAMS. H. G. Rieck, Jr. and J. D. McCormack. Dec. 15, 1955. 26p. Contract W-31-109-Eng-52. $4.80 (ph OTS); $2.70(mf OTS).

A mechanism which automatically monitors liquid waste streams for total beta activity was designed, fabricated, and tested. (auth)

3126 MLM-567
Mound Lab., Miamisburg, Ohio.
DEVELOPMENT OF THE FLOW SHEET FOR INCINERATING CONTAMINATED COMBUSTIBLE WASTE. Engineering Research Final Report. M. McEwen, P. J. Schauer, and T. Aponyi. May 15, 1951. Decl. Nov. 14, 1955. 52p. Contract AT-33-1-GEN-53.

An incineration process was developed as a means of reducing the volume of contaminated combustible waste. Standard equipment was incorporated into the recommended design for the incineration process with the main exception of the nozzle system. This system was used to enlarge submicron particles to proportions removable by standard methods. Decontamination without this mechanism would be sufficient for the majority of wastes but because of the ease and economy of operation, it was added as insurance against the penetration of activity when hotter batches are burned. A flowsheet is included for the entire incineration process. (C.H.)

ENGINEERING

MATERIALS TESTING

3127 AECD-3634
[Chicago. Univ. Metallurgical Lab.]
BEHAVIOR OF CERTAIN PLASTICS AND ELASTOMERS UNDER IRRADIATION. [Based on work done during the period 1942–1946]. J. G. Burr, W. M. Garrison, F. Haeckl, C. J Hochanadel, L. T. McClinton, R. A. Penneman, and R. B. Scott—Arild J. Miller and Gertrude Steel, [comps.]. 1948. Decl. Apr. 22, 1955. 25p. Contract [W-7401-eng-37]. $0.25(OTS).

The effects of x rays and electrons on the properties of various plastics and elastomers have been investigated. In general, radiation causes a decrease in electrical resistance, tensile strength, elasticity, and light transmission and an increase in hardness. (auth)

RADIOGRAPHY

3128 TID-8004
Technical Information Service, AEC.
GAMMA RADIOGRAPHY OF METAL CASTINGS AT SANDIA LABORATORY. Louise D. Patterson, Sandia Corp. Jan. 1956. 7p. $0.15(OTS).

One of Its monograph series "The Industrial Atom."

An artificially radioactive isotope of cobalt has proved to be a relatively portable and inexpensive piece of equipment for high penetration radiography of materials. This isotope Co^{60}, is used as a γ source to detect internal defects in metal castings. It has proved particularly suitable for tests on heavy castings of lead, steel, and iron which cannot be performed by the 250-kv Westinghouse x-ray machine, and also has provided an alternative to the x-ray machine for tests on aluminum, for which there is a heavy schedule. With suitable precaution against breakage and contamination, the cobalt source can be moved from one test area to another; it is thus a promising piece of equipment for use with materials like explosives which cannot safely be brought into the laboratory. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

CORROSION

3129 AECD-3702
California Research and Development Co. Livermore Research Lab., Livermore, Calif.
THE DISSOLUTION OF ZIRCONIUM AND CORROSION OF STAINLESS STEEL IN SULFURIC ACID AND NITRIC–HYDROFLUORIC ACID MIXTURES. R. H. J. Gercke and D. Lewis. Jan. 1954. Decl. with deletions Nov. 14, 1955. 11p. Contract AT(11-1)-74. $0.15(OTS).

The dissolution of zirconium metal and the corrosion of several stainless steels were measured in both sulfuric acid and nitric-hydrofluoric acid mixtures. Zirconium metal is readily dissolved in 90% sulfuric acid at 100°C or higher. Dissolution rates are high in 20% nitric–3% hydrofluoric acid mixtures at temperatures above 25°C. Chlorimet 2 was found to have very good resistance to 86% sulfuric acid at 100°C but was unsatisfactory at 225°C. Durimet 20 was estimated to be satisfactory at 100°C. Of the stainless steels tested only 309-Cb and Durimet 20 have good corrosion resistance to 20% nitric–3% hydrofluoric acid mixtures at 30°C. (auth)

Refer also to abstract 3103.

GEOLOGY AND MINERALOGY

3130 RME-3125
Minnesota. Univ., Minneapolis.
PROGRESS REPORT NO. 10 FOR PERIOD APRIL 1 TO OCTOBER 1, 1955. John W. Gruner and Deane K. Smith, Jr. Oct. 1, 1955. 18p. Contract AT-(30-1)-610.

An outline of the observations made in the field during the summer months of 1955 is given. An outline of a multiple migration-accretion hypothesis is presented. This is only a modification of ideas advanced since 1951 that the uranium was concentrated without the aid of magmatic hydrothermal waters but by near surface and ground waters. New is the proposal that concentration came about by several erosional and depositional cycles, an idea which is strengthened by a study of the lignitic uranium-bearing deposits of the Western Dakotas. A complete list of uranium minerals identified from properties in Wyoming, northern Colorado, and western South and North Dakota. (auth)

3131 AEC-tr-2384
THE TRANSITION OF ZIRCON INTO THE METAMICT STATE. K. K. Zhirov. Translated from Doklady Akad. Nauk S.S.S.R. 85, 889-91(1952). 7p.

Title listed in Nuclear Science Abstracts as NSA 7-816.

METALS AND METALLURGY

3132 BM-II-96
Northwest Electrodevelopment Lab., Albany, Oreg.
ZIRCONIUM SCRAP RECOVERY. Interim Report covering period September 1, 1953 to July 1, 1954. F. E. Block and F. Caputo. Aug. 1954. 19p. Contract AT(11-1)-140. $3.30(ph OTS); $2.40(mf OTS).

Scrap Zr alloy in the form of machine chips is contaminated with enough oxygen to prevent simple remelting to ingot. Chemical pickling with a nitric-hydrofluoric acid solution, to remove from 4 to 6% of the weight of the chips, will dissolve the high oxygen layer but a fluoride compound is formed on the chips which contributes to ingot porosity. Reduction of a portion of the residual oxygen in the scrap with Ca vapors at a temperature of 650 to 800°C will produce a product that can be remelted to form ingot metal equal in quality to melted sponge. The cost for reclaiming Zr alloy scrap using existing Kroll process Zr equipment is estimated at $2.25 per pound of finished ingot. (auth)

3133 NYO-7298
Rutgers Univ., New Burnswick, N. J. Coll. of Engineering.
FUNDAMENTAL STUDIES OF THE MECHANISM OF RADIATION DAMAGE. Technical Report No. 1. Roger Chang. Dec. 31, 1955. 25p. Contract AT(30-1)-1730. $4.80(ph OTS); $2.70(mf OTS).

The operational characteristics of the Hilger micro-focus x-ray-diffraction unit is described. Application of micro-focus x-ray-diffraction analysis to the studies of polycrystalline Cu, Ni, and diamond, with and without neutron irradiation, is reported. Significant differences are found between irradiated and unirradiated Cu and Ni specimens by means of the micro-focus x-ray-diffraction technique. The report includes x-ray rocking curve studies of diamond and Ge single crystals and grain size measurements of polycrystalline Cu and Ni specimens with and without neutron irradiation. (auth)

3134 SO-2044
General Electric Co. Research Lab., Schenectady, N. Y.
FUNDAMENTAL RESEARCH IN PHYSICAL METALLURGY. Twenty-eighth Quarterly Report. (Progress Report No. 45). W. DeSorbo, R. E. Hoffman, R. A. Oriani, and D. Turnbull. Jan. 5, 1956. 10p. Contract W-31-109-Eng-52. (56-RL-1485). $1.80(ph OTS); $1.80(mf OTS).

Preliminary measurements are reported on the effect of germanium concentration on the rate of self-diffusion of silver along grain-boundaries of Ag–Ge alloys. The results of measurements of the heat capacity of various graphite samples in the temperature range 1.5° to 4.2°K are summarized. (auth)

3135 Y-553
Carbide and Carbon Chemicals Co. Y-12 Plant, Oak Ridge, Tenn.
STATUS REPORT AND PLANT PROPOSALS FOR ZIRCONIUM PURIFICATION. W. M. Leaders. Jan. 20, 1950. Decl. Nov. 18, 1955. 18p. Contract W-7405-eng-26.

Developments in the Hf–Zr separation process involving the selective solvent extraction of thiocyanate complexes are summarized. Detailed cost estimates of four Zr production plants (capacities 50,000 to 300,000 lb/yr) are presented. (C.W.H.)

Refer also to abstract 3129.

PHYSICS

3136 NBS-4420
National Bureau of Standards, Washington, D. C.
A STUDY OF BASIC LIMITATIONS TO THE CONCEPT AND MEASUREMENT OF TEMPERATURE: INCOMPLETE EQUILIBRIUM. C. M. Herzfeld. Jan. 1956. 17p. NBS Project 0301-20-2617. Sponsored by ONR; and AEC under Contracts NAord-21-48 and CS-640-55-9. $3.30(ph OTS); $2.40(mf OTS).

The growing importance of extremely high temperatures has made increasingly important the development of new methods of measuring temperature and the study of temperature under non-equlibrium conditions. The present survey is a contribution towards revealing the state of the art in this area and, as such, provides the background against which future work can be undertaken. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

3137 UCRL-4628
California. Univ., Livermore. Radiation Lab.
INTERMEDIATE COMPOUNDS BETWEEN LITHIUM AND LEAD. II. THE CRYSTAL STRUCTURE OF Li_8Pb_3. A. Zalkin, W. J. Ramsey, and D. H. Templeton. Dec. 27, 1955. 13p. Contract W-7405-eng-48. $0.15(OTS).

The compound Li_8Pb_3 has been characterized by single crystal and powder x-ray diffraction data. It is monoclinic, space group C2/m, with $\underline{a}$ = 8.240, $\underline{b}$ = 4.757, $\underline{c}$ = 11.03 A, β = 104° 25′, and Z = 2. There is a body centered cubic pseudocell with $\underline{a}$ = 3.364 A and containing two atoms. The structure consists of ordered substitution in these sites in such a way that one-third of the Pb atoms have 8 Li neighbors each and two-thirds have one Pb and 7 Li neighbors each. (auth)

ELECTRONS

3138 AEC-tr-2391
DETERMINATION OF THE EFFECTIVE CROSS SECTION FOR ELECTRON LOSS BY ATOMIC NITROGEN IONS IN THE ENERGY RANGE OF 485 TO 1180 KEV. M. I. Korsunskii, L. I. Pivovar, A. M. Markus, and Kh. L. Leviant. Translated from Doklady Akad. Nauk S.S.S.R. 103, 399-402(1955). 5p. Available from Associated Technical Services (Trans. 83H8R), East Orange, N. J.

A study was made of the processes of electron loss by

N during the passage of singly charged N^{14} ions through a gaseous target in the energy internal 485 to 1180 kev. Values of the effective cross sections obtained for electron loss were found to be linear with pressure change until an equilibrium was reached at high pressures. A marked energy dependence was found. (D.E.B.)

Refer also to abstract 3160.

INSTRUMENTS

3139 WAPD-T-38 and Suppl.
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
TRANSPORT DELAY SIMULATION CIRCUITS. G. S. Stubbs and C. H. Single. [1954]. 65p. Contract [AT-11-1-GEN-14].

A simple technique is described for obtaining the transport delay needed in the investigation of the performance of physical systems by analog computation. The system used only high gain d-c amplifiers with associated feedback components, and provides greater accuracy and simplicity than was previously available. A detailed analysis of the circuits is given. A supplement discusses a limitation of the delay circuits and methods of overcoming the limitations. (B.J.H.)

ISOTOPE SEPARATION

3140 TID-5214
Tennessee Eastman Corp., Oak Ridge, Tenn.
ELECTRICAL EQUIPMENT FOR TANKS AND MAGNETS. C. R. Baldock and E. D. Hudson—H. Wesley Savage, ed. Apr. 1947. Decl. Feb. 23, 1955. 410p. Contract W-7401-eng-23. (NNES-I-10) $2.65(OTS).

An account is given of the electrical engineering phases of the electromagnetic separation process as they relate particularly to the electrical equipment for tanks and magnets used in operating the calutrons for the separation of isotopes. The principal subjects covered include the magnet with supply equipment and controls, the h-v supplies for tanks used, and the tank auxiliary electrical equipment. Details of the magnet and its supply along with two types of current regulators used are presented. A discussion of protective gaps is also included. In the section on the electrical equipment for tanks and magnets, the two h-v power supplies associated with the three types of calutrons used in the plant and the auxiliary power supplies that are required for operation of the ion sources are discussed. (D.E.B.)

MEASURING INSTRUMENTS AND TECHNIQUES

3141 HW-38682
Hanford Atomic Products Operation, Richland, Wash.
A SINGLE TRANSISTOR HIGH VOLTAGE SUPPLY. W. G. Spear. Jan. 1, 1956. 7p. Contract W-31-109-Eng-52. $0.10(OTS).

A subminiature single transistor oscillator high voltage supply, suitable for replacement of vibrator and fly-back supplies in GM counters and portable scintillation equipment was designed and tested. It delivers a negative 900 v d. c. at 20 μa for 400 hrs. per battery set consisting of 6 RM-12 Hg cells in series. The supply voltage has a comparatively sharp end-point as characterized by Hg cell life. All components are readily available. The over-all parts cost for such a supply is about $40 and the life of the transistor is long compared with that of an electron tube. (auth)

NEUTRONS

3142 DP-33
Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.
NEUTRON ENERGY SPECTRUM IN D_2O. H. D. Brown and D. S. St. John. Feb. 1954. Decl. July 29, 1955. 40p. Contract AT(07-2)-1.

The energy spectrum of neutrons from a spatially homogeneous source in an infinite amount of D_2O moderator is expressed by an integral equation. The effects of chemical binding and the Maxwellian distribution of deuteron velocities are taken into account for neutron energies between zero and 2.5 ev. The scattering cross section is taken as a three parameter function of the relative velocity, fitted to experimental data. Numerical solutions for the energy spectra are obtained for a series of absorption strengths with Σ_a between zero and 0.0528 cm^{-1} at a moderator temperature of 290°K (0.025 ev). (auth)

NUCLEAR PHYSICS

3143 BNL-367
Brookhaven National Lab., Upton, N. Y.
QUARTERLY PROGRESS REPORT [FOR] JULY 1–SEPTEMBER 30, 1955. (Unclassified Section). 59p. $0.40.

Abstracts of papers submitted for journal publication are included. Operation of the cosmotron was maintained throughout the period with few interruptions. The study of relationships between K mesons which decay in different ways was continued. Development work on components for the alternating gradient synchrotron was continued. Resonance diagrams are given as a function of quadrupole voltage data taken from the electron analogue. Included are discussions of the magnet, injector structures, and the rf cavity. The reactor was operated at an average power level of 22.37 Mev, and the reactor research programs are discussed. Essential features of a ball-kiln unit for the disposal of liquid wastes, to be used in the conversion of aluminum nitrate and zirconium and aluminum fluorides to the oxides, are shown. The study of radiation-induced polymerization was continued. Features in the design of the Liquid Metal Fuel Reactor are discussed. Data on the performance of liquid scintillation counters are given. The testing of a procedure for analysis of urine samples for radiostrontium was completed. Preliminary results of the radiation-induced mutation program are discussed. Data on radiation-induced mammary tumors in rats are tabulated. The incorporation of At^{211} into aromatic nuclei via diazonium compounds is discussed. The mechanism for the fixation of CO_2 into the number-6 C atom of uric was studied. Tissue acetylcholinesterase was studied using Co^{60} γ radiation. The effects of reactor radiation on skin were studied. Preliminary investigation shows the RBE of At^{211}

α particles, as compared to I^{132} β particles, in the rat thyroid to be about 3. (For preceding period see BNL-355.) (B.J.H.)

3144 ORNL-1975
Oak Ridge National Lab., Tenn.
PHYSICS DIVISION SEMIANNUAL PROGRESS REPORT FOR PERIOD ENDING SEPTEMBER 10, 1955. J. L. Fowler and E. O. Wollan, eds. Feb. 1, 1956. 117p. Contract W-7405-eng-26. $18.30(ph OTS); $6.00(mf OTS).

The theory of relativistic wave mechanics is briefly discussed. A simple generalization of the extreme shell model, based on the kinematics of the collective model, is proposed for the correlation of nuclear ground-state properties. The γ-ray yields from Coulomb excitation of Pd, Mo, Te, Ru, Re, and Ir isotopes were measured, and complete results are tabulated. Gamma yields from proton-bombarded isotopes are also given. Observations were made of the Doppler shift in the γ-ray energy in order to measure the lifetimes of the transitions. Measurements were made on transitions in ThC″, B^{10}, B^{11}, and Si^{28}. The reaction $Li^6(He^3,p)Be^8$ was studied with a NaI crystal spectrometer in a search for Be^8 energy levels in the range 0 to 14 Mev. Relative yields and angular correlations of the γ rays in the reaction $Si^{28}(p,p'\gamma)Si^{28}$ are given. Gamma yields from the reaction $Be^9(p,\gamma)B^{10}$ are also given. The energy resolution of protons from the ORNL 2.5-Mv Van de Graaff was investigated by a study of the γ yield from the reaction $Al^{27}(p,\gamma)Si^{28}$. Cross sections for the $H^3(d,n)He^4$ reaction from 1 to 5 Mev are given. A study of the $V^{51}(p,n)Cr^{51}$ reaction was made, and the neutron angular distributions and yields as a function of proton energy are shown. The fission cross section of U^{233} was measured relative to U^{235} over the energy range 3.4 to 150 kev. The $I^{127}(n,\gamma)I^{128}$ reaction was used as a detector in the measurement of the neutron absorption cross section of U^{235} and Pu^{239} from 5 to 50 kev. Equations are given for the activation of cylinders. The angular distributions of neutrons elastically scattered from F, at 0.66, 1.05, 1.45, 215, and 2.92 Mev, are given. A coincidence method was used to study the differential elastic scattering of neutrons from Ne, and resultant cross sections are shown. The polarization resulting from elastic neutron scattering by Li^7 is shown as a function of incident neutron energy. The cross section for the $Be^9(n,\alpha)He^6$ reaction is also shown. The development of millimicrosecond time-of-flight neutron spectrometry is discussed, and resonances in Bi and Al were measured using this technique. The gamma spectrum and decay scheme of Mg^{27} are given. Gamma scintillation spectrometers and β detectors were used to obtain the decay schemes of Ca^{49} and Sc^{49}. Gamma scintillation spectroscopy was used to study the nuclear levels in Sr^{88} from the disintegration of Y^{88} and Rb^{88}. A NaI crystal was used to study the radiations from Th^{232}, and the half life of Th^{232} was found to be 1.40×10^{10} years, with an expected uncertainty of 5%. A study was made of the effect that the spheroidal shape of the Np^{237} nucleus has on its α emission, and results indicate preferential emission of the α particles at the major nuclear axis of Np^{237}. Cross sections for electron capture by protons and electron detachment by H^- ions were obtained. Cross sections were also obtained for electron loss by fast He atoms from 30 to 200 kev using target gases of H, He, N, O, Ne, and A. Diagrams are shown of an atomic-beam magnetic-resonance apparatus. A theoretical interpretation is made of the small angle neutron scattering from Fe. Antiferromagnetic structures in $MnBr_2$ and $FeBr_2$ were studied. Results of a neutron-diffraction study of the magnetic structure of Mn_2Sb are summarized. Neutron-diffraction studies were also made on perovskite-type compounds $La(Mn,Cr)O_3$ and $(La,Sr)FeO_3$. Neutron-diffraction patterns of the Pd–H system are shown. Diagrams are given of the cascade accelerator installation and of an ion-pulsing system. A time interval-pulse converter has been constructed which will permit use of the standard ORNL multichannel analyzers for time-interval analysis. The energy response of CsI to protons is given, and the phosphorescence of CsI was also studied. The variation in resolution of a scintillation counter with variation in the efficiency of light collection was also studied. The peak efficiency of various NaI(Tl) crystals is given as a function of γ energy. Diagrams are given for a crucible to be used in the manufacture of LiI(Eu). An investigation was made of the properties of liquid scintillators, and a pulse-height comparison is made for various scintillators. Neutron collimator experiments were continued. Designs are given for a scintillation spectrometer to be used in connection with medical applications of radioisotopes. Complete circuit diagrams are given, and its performance was studied. Suitable collimators for the medical spectrometer are also given, and the response of such focusing collimators is shown. Circuit diagrams are given for a surgical scintillation probe. Progress on multichannel pulse-height analyzers is also reported. The circuit diagram for a stable gated amplifier is given. (For preceding period see ORNL-1879.) (B.J.H.)

NUCLEAR REACTORS

3145 BNL-1986
Brookhaven National Lab., Upton, N. Y.
A MEASUREMENT OF NEUTRON TEMPERATURE IN A URANIUM ROD-WATER MODERATED LATTICE. H. Kouts, K. Downes, G. Price, and R. Sher. Aug. 16, 1954. Decl. Oct. 27, 1955. 11p. Contract AT-30-2-Gen-16.

The relative danger coefficients of B and Cd have been measured in an assembly of 1.15% enriched U rods in H_2O, at a H_2O to U volume ratio of 3. The experiment consisted in finding the relative effects on neutron multiplication of measured amount of B and Cd in the H_2O moderator. The ratio of the observed danger coefficients is a measure of the ratio of the cross-sections of the two poisons, and since the two have very different cross-section curves in the thermal range, a basis for the estimation of a neutron temperature exists. Under the assumption that the thermal neutrons have a Maxwell distribution of velocities, the measurement implies a characteristic temperature of 0.0262 ± 0.0014 volts (304° ± 16°K). The H_2O temperature at the time of the measurement was 297°K. (auth)

3146 BNL-2395
Brookhaven National Lab., Upton, N. Y.
EVALUATION OF THE UNIVAC DATA FOR A LIQUID METAL FUEL REACTOR. B. Mozer. July 28, 1954. Decl. Nov. 16, 1955. 26p. Contract AT-30-2-Gen-16.

The Univac solutions to 2-group neutron diffusion equations for a multi-region liquid metal fuel reactor are evaluated. Critical size, efficiency of immoderator which exchanges slow neutrons for fast ones by means of fission, effect of container, size of thorium fluoride blanket, and breeding gain are studied. The neutron economy in each region was calculated, and the neutron leakage was determined. Results obtained from the data are compared with previously obtained results, and errors in the Univac data are discussed. (M.P.G.)

3147 IDO-16213
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
FISSION PRODUCT MONITORING IN REACTOR COOLANT STREAMS. R. L. Heath. Jan. 1, 1956. 113p. Contract AT(10-1)-205. $0.60(OTS).

In the operation of high-flux, H_2O-cooled reactors, the detection of fission product activity in coolant streams is an important consideration. MTR experience has indicated the limitations of systems normally employed for this purpose. This has led to the development of a new type fission product monitor exhibiting nearly ideal characteristics. This system utilizes continuous isolation of fission product iodine, combining gamma energy discrimination with the use of ion exchange resins. The system responds essentially only to 86-sec I^{136}, 54-min I^{134}, and 6.7-hr I^{135}. The use of iodine activity integrated upon an anion resin column achieves sensitivity orders of magnitude above direct stream observation. Operational experience with this type monitor has indicated negligible response to non-fission product background activity with more than adequate sensitivity for the detection of fission products. A review of the methods which have previously been employed for the detection of fission products is presented with a discussion of their relative merits in comparison with the new iodine system. Information is presented concerning the mechanisms of fission product evolution from different type fuel elements and the operation consequences of fuel cladding failure as gained from MTR experience with actual fuel element failure. (auth)

3148 IDO-16252
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
PERTURBATION THEORY AND APPLICATIONS. I. THEORETICAL. H. L. McMurry. Jan. 11, 1956. 22p. Contract AT(10-1)-205. $4.80(ph OTS); $2.70(mf OTS).

The bases for the two group perturbation theory for reflected reactors are presented. Working equations for calculating the effects of arbitrary perturbations are derived. (auth)

3149 NAA-SR-Memo-1475
North American Aviation, Inc., Downey, Calif.
CALCULATED RADIOACTIVITY IN THE COOLANT OF AN OMR. R. J. Beeley. Sept. 29, 1955. 14p. Contract AT-11-1-GEN-8. $3.30(ph OTS); $2.40(mf OTS).

The radioactive isotopes which are expected to be most important in an organic moderated and cooled reactor are Cl^{38} from chlorine impurity in commercial hydrocarbon, Mn^{56} from the reactions $Fe^{56}(n,p)Mn^{56}$ and $Mn^{55}(n,\gamma)Mn^{56}$, and Fe^{59} from the reaction $Fe^{58}(n,\gamma)Fe^{59}$. Dose rates due to γ activities were calculated for points in the coolant system located at the top of the reactor tank on the tank axis and at the coolant surface, and on the outside surface of a 16 in. diameter, schedule 40 coolant pipe. (C.H.)

3150 NDA-16
Nuclear Development Corp. of America, White Plains, N. Y.
THE SELF-REGULATION BY MODERATOR BOILING IN STAINLESS STEEL–UO_2–H_2O REACTORS. (15-H-1). Louise Gartner and Robert Daane. June 10, 1955. 54p. $9.30(ph OTS); $3.60(mf OTS).

The safety as measured by self-regulation of excess reactivity by moderator expulsion which can be achieved with a reactor design using stainless steel fuel elements is of interest. An evaluation of the probable merits of several stainless steel reactors with light water moderator and reflector is presented. An approximate analysis of the excursions used for this evaluation is discussed. It is concluded that reactors of the type stated above will be capable of safe self-regulation by water expulsion for insertions of about two-thirds of the excess prompt reactivity that can be safely self-regulated by an aluminum reactor of the BORAX I type. Possible methods of improvement are suggested. (auth)

3151 WAPD-128
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
CRITICAL EXPERIMENTS ON A HIGHLY ENRICHED HOMOGENEOUS REACTOR. J. R. Brown, B. H. Noordhoff and W. O. Bateson. May 1955. Decl. Nov. 30, 1955. 55p. Contract AT-11-1-GEN-14.

Critical experiments with a highly enriched homogeneous reactor have been performed in the range of $H:U^{235}$ atomic ratios from 1633 to 1776. The cylindrical core has a fixed diameter of 36 in. and heights between 23 and 51 in. An aqueous solution of $UO_2(NO_3)_2$ with a U^{235} enrichment greater than 90% was used. An 8-in. radial H_2O reflector was available. Measurements were made of critical heights and of the reactivity worth per inch at these heights as functions of the $H:U^{235}$ atomic ratio. U^{235} critical masses are listed. Additional measurements were made to determine the control rod worths, the temperature coefficient of reactivity and the effect of the radial reflector. (auth)

Refer also to abstract 3154.

NUCLEAR TRANSFORMATION

3152 AEC-tr-2387
INTERACTION OF PROTONS WITH TRITIUM AND THE EXCITED STATE OF He^4. N. A. Vlasov, S. P. Kalinin, A. A. Ogloblin, L. N. Samoĭlov, V. A. Sidorov, and V. I. Chuev. Translated from Zhur. Ekspt.' i Teoret. Fiz. 28, 639-50(1955). 13p. Available from Associated Technical Services (Trans. 82H8R), East Orange, N. J.

Experiments are described on the investigation of the reactions $T(p,n)He^3$ and $T(p,\gamma)He^4$ in the proton energy range up to 7 Mev. The energy of the protons in a beam taken out of a cyclotron chamber was varied by slowing down in lead filters. An "all-wave" counter and a uranium fission chamber served as neutron detectors, a scintillation counter with a NaI(Tl) crystal served as a γ-ray detector. The curve σ (Ep) for the first reaction has a maximum at $E_p = 3$ Mev. For the second reaction the cros section increases monotonically in the whole energy range investigated. The angular distributions of the neutrons and of the γ rays have been investigated also. The characteristic properties of the excited state of He^4 are discussed. (auth)

RADIATION ABSORPTION AND SCATTERING

3153 AECU-3147
Case Inst. of Tech., Cleveland.
ANALYTIC APPROACH FOR THE PION-PROTON SCAT-

TERING PHASE SHIFTS. Technical Report No. 25. W. Rarita. Dec. 7, 1955. 13p. Contract AT-11-1-gen-16. $3.30(ph OTS); $2.40(mf OTS).

A simple method of solving for the phase shifts of pion-proton scattering is presented. The rapid solution afforded can be utilized to give starting values to an electronic computer or alternatively to analyze with more ease the variation of the phase shifts as a function of the input data in terms of the coefficients of the angular distributions. A new plot of a function of the total cross-section versus the pion energy is introduced. The near straight line resulting should help to evaluate the experimental data. (auth)

3154 BNL-370
Brookhaven National Lab., Upton, N. Y.
THE EFFECT OF FOIL HOLDERS ON THE FLUX IN URANIUM–WATER LATTICES. T. Auerbach. Nov. 1955. 18p. $0.20(OTS).

The distribution of neutrons in foil holders inserted between U rods of U–H_2O lattices is investigated. By use of diffusion theory, the flux is shown to be strongly depressed in Al holders and weakly depressed in lucite holders, a result in agreement with experiment. Simplified procedures of calculation are discussed for the purpose of obtaining numerical answers with a minimum amount of work. (auth)

RADIATION EFFECTS

3155 LAMS-1973
Los Alamos Scientific Lab., N. Mex.
INFLUENCE OF GAMMA IRRADIATION ON RG 8/U CABLE. Robert M. Kloepper. Nov. 1955. 6p. Contract W-7405-eng-36. $1.80(ph OTS); $1.80(mf OTS).

Static measurements have been made of the currents produced by Co^{60} gamma irradiation of solid dielectric RG 8/U cable. Sensitivity curves are presented as a function of the magnitude and polarity of the collection voltage to 90 volts. It is shown that the current is due to a polarity- and voltage-sensitive ionization component and to a polarity- and voltage-insensitive component attributed to the Compton process. The total cable sensitivity at –90 volts, with saturation not achieved, was $(11 \pm 1) \times 10^{-12}$ coulomb per roentgen-meter of cable, or 0.08 percent of what one would expect from ionization in an air dielectric cable of this volume. (auth)

3156 NAA-SR-1398
North American Aviation, Inc., Downey, Calif.
THERMAL CONDUCTIVITY OF GRAPHITE: THEORETICAL STUDY OF ELECTRON-PHONON SCATTERING. John E. Hove. Jan. 1, 1956. 43p. Contract AT-11-1-GEN-8. $0.30(OTS).

A calculation has been made of the contribution to the thermal resistance in graphite of the scattering of the phonons by the conduction electrons. This investigation was undertaken in order to determine whether the effects of neutron damage on the thermal conductivity could be explained by the change in the number of effective electrons caused by trapping of the electrons. The conclusion reached is that this cannot be done, principally because it is found that the thermal conductivity, due to this mechanism, should become more strongly dependent on temperature as electrons are removed from the conduction band, whereas it is observed that this temperature dependence is weakened. The important implication of this result is that the thermal conductivity is a sensitive probe for detecting the lattice defects introduced by neutron damage, since it is not complicated by electronic effects. (auth)

Refer also to abstract 3127.

RADIOACTIVITY

3157 IDO-16247
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
EXPERIMENTAL AND THEORETICAL VALUES OF THE GAMMA DECAY DOSE RATE AND HEATING FROM SPENT MTR FUEL ELEMENTS. W. C. Francis and L. L. Marsden. Jan. 13, 1956. 58p. Contract AT(10-1)-105. $9.30(ph OTS); $3.60(mf OTS).

A project at the MTR to measure and calculate gamma decay dose rates and heating from spent MTR fuel elements as a function of fission time, cooling time, and distance from the source is reported. A comparison of these data is presented. Fuel elements with cooling times from 3¾ hours to 218 days after reactor shutdown and burn-ups from 3.5 to 35% have been studied. Experimental and theoretical data are generally in good agreement for dose rate measurements, but are not as consistent for heating values. (auth)

SPECTROSCOPY

3158 IDO-16168
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
MTR CRYSTAL SPECTROMETER DATA PRINTING SYSTEM. G. L. Smith and L. G. Miller. Dec. 7, 1955. 25p. Contract AT(10-1)-205. $4.80(ph OTS); $2.70(mf OTS)

A data printing system using glow-transfer counters and an electric typewriter has been installed on the MTR crystal spectrometer to replace the commercial scaler and traffic counter system. The 1-μsec. scaler has scales of 1 to 16 preceding the 6 glow-transfer counters. After a count, a motor driven scanning switch connects the 10 points of each glow-transfer tube simultaneously through triode-operated relays to the solenoid actuators of the 10 numbers of the typewriter. Only the point having the glow discharge will record. The system will handle up to 10^6 cpm and print digits without the attendant short lifetimes of electric reset registers and traffic counters. In addition, the scaling factor, time, crystal position, arm angle, and sample wheel position are printed on folded and perforated teletype sheets which are later bound to form a permanent record. A special spacing is used which permits calculations to be made on the data sheets without data transfer. (auth)

3159 NYO-6148
Connecticut. Univ., Storrs.
MILLIMICROSECOND TECHNIQUES FOR FAST NEUTRON SPECTROSCOPY. Final Report. Stephen S. Friedland. Feb. 1, 1956. 42p. Contract AT(30-1)-1465. $7.80(ph OTS); $3.30(mf OTS).

Techniques and apparatus for measuring the energy spectrum of scattered neutrons in the energy range of 2.0 to 10 Mev have been developed. A method of producing mμsec pulses of neutrons, suitable detectors, and methods of extending the time-of-flight measuring technique were developed and are described. (D.E.B.)

THEORETICAL PHYSICS

3160 LAMS-1949
Los Alamos Scientific Lab., N. Mex.
THEORETICAL EXPECTATIONS CONCERNING DOUBLE β-DECAY. E. J. Konopinski. Aug. 1955. 17p. Contract [W-7405-eng-36].

A re-evaluation of theoretical expectations for double β decay is presented, both on the basis that no neutrinos are emitted, and also on the basis that two neutrinos are emitted. No neutrinos should be emitted according to the Majorana hypothesis (the anti-neutrino identical with the neutrino). Evaluation here merely requires integration, over the spectrum, of formulas already published by Primakoff. Comparatively short half lives are expected, decay rates which should already have been observed in the several experimental attempts. Because of the apparent failure to observe decay rates as large as this, an attempt is made here to arrive at the slowest rate which can reasonably be expected. It is found that it would be very difficult to understand why the half-life should be longer than about 6×10^{17} years for a kinetic energy release of 4 Mev. Actually, a much more reasonable expectation is less than 1.5×10^{15} years. A complete re-calculation of the expectations for Dirac neutrinos is presented, making use of the knowledge gained about single β decay since Mayer's original work was published. It is found that as short a half-life as 1.2×10^{18} years is not out of the question for a 4 Mev energy release. Even a fairly conservative estimate would make it no longer than about 10^{19} years. Methods of identifying electrons as from double β decay, through measurements on their energy distributions, are discussed. (auth)

URANIUM AND URANIUM COMPOUNDS

3161 BMI-745
Battelle Memorial Inst., Columbus, Ohio.
THERMAL CONDUCTIVITY OF POWDER-METALLURGY URANIUM. H. W. Deem and H. R. Nelson. May 21, 1952. Decl. Nov. 30, 1955. 15p. Contract W-7405-eng-92.

Thermal-conductivity measurements were made on 3 powder compacts of U and, for comparison, on one sample of cast-and-wrought metal. The conductivities of all specimens ranged from 0.23_4 to 0.24_9 watt $\text{cm}^{-1}\text{C}^{-1}$ at 40°C and from 0.25_0 to 0.26_2 watt $\text{cm}^{-1}\text{C}^{-1}$ at 100°C. The slight differences in conductivity probably can be attributed to differences in density. (auth)

3162 TID-5213
Tennessee Eastman Corp., Oak Ridge, Tenn.
DETERMINATION OF THE ISOTOPIC COMPOSITION OF URANIUM. A. E. Cameron. Jan. 1950. Decl. Feb. 23, 1955. 173p. Contract [W-7405-eng-23]. (NNES-I-13). $1.15(OTS).

A detailed discussion is given on the adaptation of known methods, particularly mass spectrometry, to the routine determination of the isotopic composition of uranium. A discussion of the mass spectrometry includes such topics as sample preparation techniques, the spectrometer tube design, the associated electronics and vacuum system, operating methods, factors affecting the accuracy of the results, scanning methods, maintenance methods, and information on the critical ionization potential of UF_6. A discussion of counting techniques includes application of radioactivity measurements, sample preparation techniques α-counting equipment, fission counting techniques, instrument calibration, and calculations. (B.J.H.)

NOTICE

It has been necessary to omit the Author Index and Numerical Index of Reports usually included in this issue. Cumulated indexes for Vol. 10, Nos. 1–12A, will appear in No. 12B, dated June 30, 1956.